



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

No. 1769

HANDBOOK OF THE GATLING GUN, CALIBER .30

MODELS OF 1895, 1900, AND 1903

METALLIC CARRIAGE AND LIMBER AND CASEMATE MOUNT

(SEVEN PLATES)

JUNE 1, 1905
REVISED OCTOBER 15, 1906
REVISED APRIL 11, 1910



WASHINGTON
GOVERNMENT PRINTING OFFICE
1917

HANDBOOK OF THE GATLING GUN, CALIBER .30, MODELS OF 1895, 1900, AND 1903, METALLIC CARRIAGE AND LIMBER, AND CASEMATE MOUNT.

The Gatling gun, caliber .30, models of 1895, 1900, and 1903, is a machine gun constructed to take the same ammunition as the United States magazine rifle, caliber .30, model of 1903, chambered for 1906 ammunition. Models of 1895 and 1900 were made for Krag ammunition while model of 1903 was made for 1903 ammunition, but all three models have been altered for 1906 ammunition. There has been no change in the number of parts but only a change in the dimensions. Bronze parts are painted an olive drab color while the barrels and pointing lever are browned and the frame is blued.

NOMENCLATURE.

[Those parts of which the names have a * opposite are bronze ; the others are steel.]

PARTS.

- No. 1. *Adjusting knob.
2. Adjusting-knob screw.
3. Adjusting-knob spring.
4. Adjusting-knob spring screw.
5. *Adjusting-knob washer.
6. Barrels (10).
7. *Barrel plate, front.
8. *Barrel plate, rear.
9. Barrel-plate key.
10. *Breech casing.
11. Breech-casing screws (6).
12. Bullet rest.
13. Bullet-rest pin.
14. Bullet-rest screws (2).
15. *Cam cylinder.
16. Cam-cylinder screws (2).
17. Cam-cylinder recoil plate.
18. Cam-cylinder recoil-plate screws (2).
19. *Carrier block.
20. Carrier-block dowel pin.
21. *Cascabel plate.
22. Cascabel-plate screws (2).

- No. 23. Cocking switch.
24. *Cocking-switch knob.
 25. *Cocking-switch knob sleeve.
 26. Cocking-switch plug.
 27. Cocking-switch plug pins (2).
 28. Cocking-switch plug spindle.
 29. Cocking-switch plug-spindle pin.
 30. Cocking-switch plug spring.
 31. Cocking-switch screw.
 32. Cocking-switch spring.
 33. Cocking-switch spring spindle.
 34. Crank.
 35. *Crank handle.
 36. Crank-handle rivet.
 37. Crank key.
 38. *Crank latch.
 39. Crank-latch screw.
 40. Crank-latch washer.
 41. Crank shaft.
 42. Crank-shaft collar.
 43. Crank-shaft spline.
 44. Crank-shaft worm.
 45. Crank-shaft worm key.
 46. *Diaphragm.
 47. Diaphragm screws (2).
 48. Extractors (10).
 49. Extractor screws (10).
 50. Firing pins (10).
 51. Firing-pin bushings (10).
 52. Firing-pin bushing screws (10).
 53. Firing-pin nuts (10).
 54. Firing-pin nut pins (10).
 55. Firing-pin sleeves (10).
 56. *Feed-guide body.
 57. Feed-guide neck.
 58. Feed-guide neck screws (4).
 59. Feed-guide pendulum.
 60. *Feed-guide pendulum screw.
 61. Feed-guide pendulum spring.
 62. Feed-guide pendulum-spring spindle.
 63. Frame.
 64. *Front sight.
 65. Front-sight screw.
 66. *Front washer.
 67. *Hopper.
 68. *Hopper-hinge block.
 69. Hopper-hinge block screws (2).
 70. Hopper-hinge pin.
 71. Hopper latch.
 72. Hopper-latch screw.
 73. Hopper-latch spring.
 74. Hopper plow.
 75. Hopper-plow screws (2).
 76. *Hopper throat, left wall.

- No. 77. *Hopper throat, right wall.
- 78. Hopper-throat dowel pin.
- 79. Hopper-throat screws (4).
- 80. Hopper-throat wheel.
- 81. Hopper-throat wheel pivot.
- 82. *Hopper-throat wheel bushings (2).
- 83. Hopper thumbscrew.
- 84. Locks (10).
- 85. *Lock cylinder, body.
- 86. *Lock cylinder, face.
- 87. Lock-cylinder screws (2).
- 88. *Lock-plug body.
- 89. *Lock-plug chain and screw eye.
- 90. *Lock-plug handle.
- 91. *Lock-plug head.
- 92. Lock-plug hook.
- 93. Lock-plug hook screws (2).
- 94. Lock-plug screw.
- 95. *Lock-plug sleeve.
- 96. Lock-plug sleeve screws (3).
- 97. Main shaft.
- 98. Main-shaft casing (leather).
- 99. Main-shaft spline, front.
- 100. Main-shaft spline screw, front.
- 101. Main-shaft spline, middle.
- 102. Main-shaft spline screws, middle (2).
- 103. Main-shaft spline, rear.
- 104. Main-shaft spline rivet, rear.
- 105. *Main-shaft worm gear.
- 106. Main springs (10).
- 107. Pointing lever.
- 108. *Pointing-lever binder.
- 109. Pointing-lever binder pin.
- 110. Pointing-lever binder-pin key.
- 111. Pointing-lever binder-pin washer.
- 112. *Pointing-lever binder plate.
- 113. Pointing-lever binder screw.
- 114. Pointing-lever axis pin.
- 115. Pointing-lever axis-pin nut.
- 116. Pointing-lever axis-pin washer.
- 117. *Rear-guide nut.
- 118. Rear-guide nut key.
- 119. Rear-guide nut-key screw.
- 120. Rear-sight body.
- 121. *Rear-sight seat.
- 122. Rear-sight seat screw.
- 123. Rear-sight spring.
- 124. Rear-sight spring screw.
- 125. Rear-sight windage-slide.
- 126. Rear-sight windage-slide adjusting screw.
- 127. Rear-sight windage-slide adjusting-screw nut.
- 128. Rear-sight windage-slide adjusting-screw nut pin.
- 129. *Screw cap.
- 130. Trunnions (2).

IMPLEMENTS.

- No. 131. *Cascabel-plate wrench.
 132. Drift.
 133. Lock screw-driver.
 134. Pin wrench.
 135. *Pointing-lever axis-pin nut wrench.
 136. *Rear-guide nut wrench.
 137. Shell driver.
 138. Small screw-driver.
 139. T screw-driver.
 140. *Wiping rod.
- An extra feed-guide is furnished with each gun.

SPARE PARTS.

- 1 lock, complete (extra).
 2 extractors.
 2 extractor screws.
 1 main spring.
 1 firing-pin nut pin.
 1 firing-pin bushing screw.

Plate I shows the gun mounted on the metallic carriage.

Plates II and III show the component parts of the gun.

Plate IV shows the implements.

Plate V shows a development of the cam cylinder, rear barrel plate, cocking switch, barrels, and locks.

The same numbers have been given to the different parts in these plates in the nomenclature above and in the description that follows:

GENERAL DESCRIPTION.

The gun has 10 barrels symmetrically placed around and parallel to a central shaft and held in place at the muzzle and breech by two circular plates splined to this shaft, the barrels thus forming the elements of a cylinder, of which the central shaft is the axis.

In rear of the barrels and splined to the central shaft is a cylinder, called the "carrier block," having on its exterior grooves or half cylinders in prolongation of the chambers of the barrels. These grooves receive the cartridges as they fall from the hopper or feed and guide them while they are being pushed into the chambers of the barrels by the locks.

The locks contain the firing mechanisms and slide backward and forward in guides on the exterior of the lock cylinder, which lies in rear of the carrier block and is also attached to the central shaft. The rear end of the central shaft is connected to a transverse shaft and crank by a worm gearing.

This main shaft has its front end journaled in a steel frame which runs across the front and along the sides of the barrels and its rear

end journaled in a diaphragm attached to a breech casing screwed to the frame. This frame is provided with trunnions, which rest in corresponding sockets in the mount.

The bronze casing envelops all the parts of the breech mechanism, protecting them from injury by dirt or blows. Within this casing is a hollow cylinder called the "cam cylinder," which has on its interior surface cam grooves. This cylinder is stationary, and as the main shaft carrying the carrier blocks, locks, etc., revolves, these grooves guide lugs on the rear ends of the locks so as to move the latter backward or forward at the proper time, forcing the cartridge into and closing the chamber, firing the cartridge, and withdrawing the empty case.

The operation of the gun may be briefly described as follows: On turning the crank the main shaft, barrels, carrier block, and lock cylinder revolve; the cartridges, falling from the feed guide into which they have been stripped from the pasteboard boxes, are received by the hopper and delivered in turn one to each groove of the carrier block; the locks, revolving with the lock cylinder and carried forward and backward by the cam cylinder, force the cartridges into and close the chambers and fire the cartridges. As long as the crank is turned and the supply of cartridges maintained, the firing will continue. A pointing lever permits of effective control of the elevation and direction of fire.

DETAILED DESCRIPTION OF GUN.

The main shaft (97, Pl. II) constitutes the axis of revolution of the system. It is supported at the front end by a bearing in the frame (63, Pl. II) and near the rear by that in the diaphragm (46, Pl. III). The first shoulder on the main shaft from its front end limits its movement forward by bearing against the front washer (66, Pl. II). The second shoulder forms a bearing for the front barrel plate (7, Pl. II), the third for the rear barrel plate (8, Pl. II), and the fourth for the worm gear (105, Pl. III). The front thread is for the rear-guide nut (117, Pl. III); the rear thread for the adjusting knob (1, Pl. III). The main-shaft spline, front (99, Pl. II), secured to the main shaft by the main-shaft spline screw, front (100, Pl. II), insures the rotation of the front barrel plate (7, Pl. II). The main-shaft spline, middle (101, Pl. II), secured to the main shaft by the main-shaft spline screws, middle (102, Pl. II), insures the rotation of the rear barrel plate (8, Pl. II) and lock cylinder (85 and 86, Pl. II). The main-shaft spline, rear (103, Pl. II), riveted to the main shaft insures the rotation of the worm gear (105, Pl. III) and adjusting-knob washer (5, Pl. III). The hole in front of the second shoulder is for the front barrel-plate key (9, Pl. III); that

through the front thread is for the rear guide-nut key (118, Pl. III), and the groove in rear of the adjusting-knob thread is for the adjusting-knob screw (2, Pl. III). That part of the main shaft between the barrel plates is protected by the main-shaft casing (leather) (98, Pl. II).

The barrels (6, Pl. II), ten in number, are centered cylindrically around and are connected with the main shaft by the barrel plates, front and rear (7 and 8, Pl. II). The rear ends are threaded and firmly screwed into the rear barrel plate. The front ends pass through the front barrel plate, which is firmly held by the barrel-plate key (9, Pl. III) passing through the main shaft. Slots are cut in the rear end of the barrel and in the rear barrel plate for the reception of the hook of the extractor. The barrels, in bore, rifling, and chamber, are the same as those of the United States magazine rifle, model of 1903, chambered for 1906 ammunition, except they are 7.5 inches longer and give, with the 2,700 feet per second ammunition, 2,811 feet per second muzzle velocity.

The carrier block (19, Pl. II) is held in position by the cylindrical projections on the rear barrel plate and lock cylinder entering its hollow interior, and the alignment of the ten longitudinal undercut grooves on its exterior, in which the locks (84, Pl. III) move, is maintained with those in the lock-cylinder body (85, Pl. II) and with the barrels (6, Pl. II) by the carrier-block dowel pin (20, Pl. II). These grooves receive the cartridges as they are fed by the hopper (67, Pl. II) and are so shaped as to guide them into the chambers when pushed forward by the locks (84, Pl. III). Near the rear end of the carrier block is the circumferential groove into which projects the hopper plow (74, Pl. III), which ejects the empty cartridge cases as they are rotated against it.

The lock cylinder consists of the body (85, Pl. II) and the face (86, Pl. II) firmly united by the two screws. The face closes the space between the body and the breech casing (10, Pl. II). In the exterior of the body are ten longitudinal undercut grooves, and through the face ten corresponding holes in which the locks move. The rear barrel plate, carrier block, and lock cylinder are firmly held together between the third shoulder of the main shaft and the rear guide nut (117, Pl. III), which is screwed on the main shaft tightly against the rear end of the lock cylinder and retained in place by the rear guide-nut key (118, Pl. III) passing through the screw hole in the lock cylinder and held there by the rear guide nut-key screw (119, Pl. III).

The cam cylinder (15, Pl. II) surrounds the body of the lock cylinder, its exterior surface snugly fits the interior of the breech casing (10, Pl. II), and it is secured to the diaphragm (46, Pl. III) by the cam-cylinder screws (16, Pl. III). It does not revolve with the main

shaft. In the interior surface are two grooves, extending from the front end upward to the rear, in which the lugs of the locks work and by which is imparted to them their movements to and from the barrels. Plate V shows a development of these grooves, the barrels, and the firing mechanism. The front ends of these grooves are joined by a segment at right angles to the main shaft, called the "firing flat," and the rear ends by a similar segment, called the "loading flat." The right groove is called the "cocking groove" and the left the "extracting groove." The cocking-switch seat is an undercut slot extending forward from the rear end, and the slot through the wall is for the cocking-switch screw. A notch in the loading flat receives the lock-plug hook. The firing flat is faced with the cam-cylinder recoil plate (17, Pl. III), which is hardened to withstand the shock of discharge. The recoil plate, by extending a short distance down the extracting groove, protects it in case a cartridge should hang fire until after the lock has passed off the flat, and is held in place by the cam-cylinder recoil-plate screws (18, Pl. III), which are inserted from the rear end of the cylinder.

The diaphragm (46, Pl. III) supports the rear end of the main shaft; it is a heavy circular disk closely fitting the interior of the breech casing (10, Pl. II), into which it is inserted from the front and held against a shoulder on the interior by the two cascabel-plate screws (22, Pl. III). It is located in its proper position by the diaphragm screws (47, Pl. III) passing through the breech casing. The hole near the rim permits the insertion and withdrawal of the locks by the lock plug, and the notch receives the lug on the lock when drawn to the rear.

The worm gear (105, Pl. III) occupies the space between the diaphragm and the cascabel plate.

The cascabel plate (21, Pl. III) is screwed on and closes the rear end of the breech casing. When screwed into place, the arrow on the rim should be opposite the mark on the breech casing and it is there secured by the two cascabel-plate screws (22, Pl. III). The cascabel plate forms a support for the adjusting knob in regulating the head space. The countersunk hole in the center is for the adjusting-knob washer. The other holes are for the lock plug, the cocking-switch knob sleeve, the two cocking-switch plug pins, and the lock-plug chain and eye screw. On the rear face of the plate are also two recesses for the cocking-switch plug pins.

The adjusting knob is for the purpose of regulating the head space. It consists of the adjusting knob proper (1, Pl. III), the adjusting-knob screw (2, Pl. III), the adjusting-knob washer (5, Pl. III), the adjusting-knob spring (3, Pl. III), and the adjusting-knob spring screw (4, Pl. III). The adjusting knob is screwed on the rear end of the main shaft, and when completely on the adjusting-knob screw

will enter the inclined groove in rear of the thread on the main shaft. This insures the screwing of the knob fully into place, which is very important. The length of this groove limits the amount the knob can be turned in adjusting the head space. The adjusting-knob washer turns with the adjusting knob and main shaft, but has no bearing in its hole on the cascabel plate; the rear surface of its flange forms a bearing for the adjusting knob, while its front surface turns against the cascabel plate, thereby acting as a friction washer. The adjusting-knob spring is countersunk into the rear face of the washer and held therein by the adjusting-knob spring screw; it locks the adjusting knob, when adjusted to give the proper head space, by entering one of the notches in its face.

When the adjusting knob is turned to the right, the shaft with the lock cylinder, carrier block, and barrels is drawn to the rear with reference to the cam cylinder, reducing the distance between the end of the barrels and the firing flat, and hence decreasing the head space. If the adjusting knob is turned to the left, the operation is reversed, and the head space increased. Five notches are cut in the face of the adjusting knob, and each notch corresponds to a change in head space of 0.003 inch. For new guns the proper adjustment is the second notch from the right, which is marked "1." As the different bearings wear from use the head space corresponding to any notch will be increased, and in time it becomes necessary to use another notch to preserve the proper head space.

The cocking switch automatically catches the heads of the firing pins and then at the proper time releases them, firing the cartridges. To avoid unnecessary snapping of the firing pins and for safety, the cocking switch can be drawn to the rear out of reach of the firing pins. It consists of the cocking switch proper (23, Pl. III), the cocking-switch knob (24, Pl. III), the cocking-switch knob sleeve (25, Pl. III), the cocking-switch plug (26, Pl. III), the cocking-switch plug pins (27, Pl. III), the cocking-switch plug spindle (28, Pl. III), the cocking-switch plug-spindle pin (29, Pl. III), the cocking-switch plug spring (30, Pl. III), the cocking-switch screw (31, Pl. III), the cocking-switch spring (32, Pl. III), and cocking-switch spring spindle (33, Pl. III).

The cocking switch (23, Pl. III) works in a groove in the cam cylinder. It has an undercut groove through its front end in which the head of the firing pin is caught and held until the lock has moved forward onto and a short distance along the firing flat. The head of the firing pin, having passed through the groove, is released and the cartridge fired. A hole through the side is for the cocking-switch screw, and that in the rear end receives the cocking-switch spring and spindle.

The cocking-switch knob (24, Pl. III) is the handle by which the switch is drawn to the rear. It is held in place on the rear of the

cascabel plate by the cocking-switch knob sleeve; the hole through the center is for this sleeve, the rear end being enlarged to receive the cocking-switch plug; the two holes through its rim are for the cocking-switch plug pins.

The cocking-switch knob sleeve (25, Pl. III) is screwed from the front into the knob through its hole in the cascabel plate, and the shoulder on its front end limits the distance the cocking switch can be pulled to the rear.

The front end of the cocking-switch spring spindle (33, Pl. III) is enlarged for a bearing for the cocking-switch spring (32, Pl. III), and its rear end, which projects through its hole in the diaphragm, is knob-shaped. The hole in the front end is for the cocking-switch screw, by which it is fastened to the cocking switch. The cocking-switch spring (32, Pl. III) surrounds the cocking-switch spindle and bears against the head of the latter and the diaphragm, thus tending to retain the cocking switch in its forward position.

The cocking-switch screw (31, Pl. III) passes through the cocking switch and cocking-switch spring spindle, holding them together, and projects into its slot in the cam cylinder, preventing the removal of the cocking switch.

The cocking-switch plug (26, Pl. III) has a hole in the center for the cocking-switch plug spindle (28, Pl. III) and also two holes into which are driven the cocking-switch plug pins (27, Pl. III). When the plug is in its seat in the enlarged rear end of the cocking-switch knobs, these two pins project through two holes in the knob.

The cocking-switch plug spindle (28, Pl. III) passes through the cocking-switch plug and the cocking-switch knob sleeve. Its front end is shaped to engage the knob on the rear end of the cocking-switch spring spindle, and its rear end is secured into the cocking-switch plug by the cocking-switch plug-spindle pin (29, Pl. III). It should be assembled so the arrow on its rear end points in the same direction as that on the plug.

The cocking-switch plug spring (30, Pl. III) surrounds the cocking-switch plug spindle. Its front end bears against the cocking-switch knob sleeve and its rear against the cocking-switch plug.

The action of the cocking switch is as follows: When the cocking-switch knob is turned so that the cocking-switch plug pins enter their holes in the cascabel plate, the cocking switch is in its forward or the "firing" position, held there by the cocking-switch spring. When the cocking-switch knob is pulled to the rear until the cocking-switch plug pins are withdrawn from the holes in the cascabel plate and turned 90°, and allowed to enter the two recesses in the cascabel plate, the cocking switch is in its rear or "safe" position, the undercut grooves being out of reach of the heads of the firing pins. When the cocking-switch knob, in withdrawing the cocking switch, is pulled out as far as the cocking-switch knob sleeve permits, the tension of

the cocking-switch plug spring is great enough to force the cocking-switch plug to the rear far enough to withdraw the cocking-switch plug pins from their holes in the cascabel plate; but its tension is not great enough to do this when the head of a firing pin is caught in the cocking-switch groove, for the tension of the mainspring is then added to that of the cocking-switch spring. In this manner when a firing pin is caught in the cocking-switch groove the withdrawal of the cocking switch is prevented.

The lock plug is for the purpose of inserting and removing the locks, and is seated in its holes in the cascabel plate and diaphragm and in the lock-plug sleeve (95, Pl. III), which is secured to the diaphragm by the three lock-plug sleeve screws (96, Pl. III). The lock plug is composed of the lock-plug body and head (88 and 91, Pl. III) and the lock-plug handle (90, Pl. III), united by the lock-plug screw (94, Pl. III), so that the handle can turn independently of the body; the lock-plug hook (92, Pl. III), fastened to the lock-plug body by the lock-plug hook screws (93, Pl. III), and the lock-plug chain and screw eye (89, Pl. III) by which the lock plug is attached to the cascabel plate. The stud on the front part of the lock-plug handle, engaging the inner surface of the cascabel plate, retains the lock plug in its seat; when the lock-plug handle is turned so that this stud is opposite its slot in the cascabel plate the lock plug can be withdrawn. The lock-plug hook fits into its recess in the rear end of the cam cylinder and forms part of the loading flat, and the lugs of the locks, as they move along this flat, pass through the notch of the hook. If the lock plug is withdrawn when the lug of a lock is in this notch of the hook, the lock will be removed with it. A lock will be in this position when any one of the lines on the rear barrel plate is opposite the arrow on the hopper.

The breech casing (10, Pl. II) incloses and protects the mechanism. It is cylindrical in shape, with a rib on each side, by which it is fastened to the frame (63, Pl. II) by the six breech-casing screws (11, Pl. III). The lugs projecting from its under side contain the holes for the pointing-lever binder pin; the two holes beneath the ribs are for the two diaphragm screws, by which the diaphragm is fastened to the breech casing, and the hole above the left rib near the front end is for the hopper latch (71, Pl. III). The place of manufacture, number, and caliber are engraved on the top of the breech casing, and also the model of 1900 or 1903. In the model of 1895 the model is stamped on the right-hand rib.

The gun proper is assembled in and supported by the frame (63, Pl. II). The hole in the front end, which is closed by the screw cap (129, Pl. III), is for the front bearing of the main shaft; the holes in the left rail are for the port shield bracket (Pl. I), the bullet-rest screws and pin, and the breech-casing screws; and those in the right

rail are for the front sight, port shield bracket, hopper-hinge block, breech casing, and crank-handle latch screws. The trunnions (130, Pl. II) are driven into holes in the frame and upset. The left rail is beveled opposite the carrier block to give an unobstructed passage to the empty shells.

The device for revolving the main shaft consists of the crank (34, Pl. III), with its handle (35, Pl. III), and the crank shaft (41, Pl. III), with its worm (44, Pl. III) and collar (42, Pl. III).

The crank shaft (41, Pl. III) is seated in and revolves in its holes in the breech casing at right angles to the main shaft. The crank (34, Pl. III) is screwed onto its right end, which projects without the casing. It is secured from unscrewing by the crank key (37, Pl. III). The crank handle (35, Pl. III) is secured to the crank by the crank-handle rivet (36, Pl. III).

The crank-shaft worm (44, Pl. III), sprung in models of 1895 and 1900 so as to pass the sight, fastened to the crank shaft by the crank-shaft worm key (45, Pl. III) and by the crank-shaft spline (43, Pl. III), engages the worm gear on the main shaft.

It requires about one and three-fourths revolutions of the handle to produce a complete revolution of the main shaft, or to fire each of the ten barrels. To load and fire, the crank must be turned to the right.

The crank latch is for the purpose of securing the crank handle when not firing. It is pivoted on and secured to the underside of the frame by the crank-latch screw (39, Pl. III). The crank-latch washer (40, Pl. III) is inserted between the screw head and latch and allows the latter to turn without the screw. This washer is cup shaped, and acts as a spring to retain the crank latch in either of its two positions. When firing, the latch should be turned out of the way, against the breech casing.

The hopper (67, Pl. II) receives the cartridges from the feed guide and conveys them to the carrier block; its under surface is curved to conform to the carrier block and is so shaped that its front half will hold the cartridges in the grooves of the block and its rear half will allow the locks freedom in their movements; it is hinged in its seat in the hopper-hinge block (68, Pl. III) on the hopper-hinge pin (70, Pl. III), which is held in place by the breech casing.

The hopper-hinge block (68, Pl. III) is secured to the right rail of the frame by the two hopper-hinge block screws (69, Pl. III). When the hopper is closed it is locked by the hopper latch (71, Pl. III), which, with the hopper-latch spring (73, Pl. III), are retained in their seat in the hopper by the hopper-latch screw (72, Pl. III). One end of the spring bears against the latch and the other against the latch screw, causing the former to project from the hopper into

its hole in the breech casing and allowing the latch to be withdrawn when the hopper is to be opened. The opening in the hopper through which the cartridges pass is called the throat. It is enlarged at its upper end to admit the feed guide, which is secured in its seat by the hopper thumbscrew (83, Pl. III). The top of the left wall is partly cut away to discover the cause of any interruption in the regular movement of the cartridges and to facilitate its correction.

The hopper throat, left wall, and hopper throat, right wall (76 and 77, Pl. III), are aligned by the hopper-throat dowel pin (78, Pl. III), joined together by the hopper-throat wheel pivot (81, Pl. III), and secured to the hopper by the four hopper-throat screws (79, Pl. III). The hopper-throat wheel (80, Pl. III), with its bronze bushings (82, Pl. III) at each end, turns freely on the hopper-throat wheel pivot in the throat and delivers the cartridges to the carrier block properly directed and but one to each groove. The rear teeth of this wheel are larger than the front, to conform to the shape of the cartridges.

The hopper plow (74, Pl. III), fastened to the hopper by the two hopper-plow screws (75, Pl. III), projects into the circumferential groove at the rear end of the carrier block and ejects the empty cartridge shells as they are revolved against it.

The bullet rest (12, Pl. III) is a flat spring fastened to the left rail of the frame by the bullet-rest pin (13, Pl. II) and the two bullet-rest screws (14, Pl. III). Its rear end projects in toward the carrier block, and when any cartridge, not fired, is withdrawn from the chamber the bullet is struck by it and the cartridge ejected.

The feed guide (Bruce) is made up of the feed-guide body (56, Pl. III), the feed-guide neck (57, Pl. III), the four feed-guide neck screws (58, Pl. III) which secure the neck to the body, the feed-guide pendulum (59, Pl. III), and the feed-guide pendulum screw (60, Pl. III), spring (61, Pl. III), and spring spindle (62, Pl. III). The upper end of the feed-guide pendulum is pivoted in its seat in the feed-guide body by the feed-guide pendulum screw. There are two parallel grooves into which the cartridges are stripped from the paper boxes and through which they pass into the feed-guide neck. Near the bottom of each groove are two ribs which straddle the extractor groove of the cartridge. To facilitate the stripping, that part of the feed-guide body extending above the pendulum seat is flat, with a rib on its left side to guide the cartridges so each row in a box will freely enter one of the pendulum grooves. The feed-guide neck, fastened to the lower end of the feed-guide body, has a groove with ribs on opposite sides through which the cartridges pass into the hopper. Two triangular lugs, one on each side of the groove, project from the upper end of the neck into slots in the pendulum. When the groove in the latter opposite the groove in the neck is

emptied, the downward pressure exerted while stripping the cartridges from the paper boxes will swing the pendulum so that the full groove will be over the one in the neck and permit the cartridges to fall by gravity into the hopper.

To insure the pendulum swinging the proper distance, at its lower end is a lug projecting into a cavity in the body, which limits the distance through which the pendulum can swing. In it is a shallow recess that receives the head of the feed-guide pendulum-spring spindle. One end of the feed-guide pendulum spring bears against the head of this spindle, the other end against the end of the cavity. This spring forces the pendulum to swing from one side to the other and prevents it from stopping in the center, where neither groove would be over that in the neck.

The form of a lock (84, Pl. III) is, in general, cylindrical, with a T-shaped rib extending its full length, which, working in the undercut grooves in the lock cylinder and carrier block, holds the lock in place and causes it to revolve with them. At the rear end and diametrically opposite to the rib is a triangular lug that works in the grooves in the cam cylinder; consequently, when the main shaft is revolved the lock will be rotated with it and at the same time moved parallel to it, to and from the barrels. The extreme front end of the lock is reduced so as to enter the recess in the barrel, and the edge on one side is slightly beveled to clear the hopper plow. The firing-pin hole, which extends through its entire length, is contracted near the front end to conform to the shape of the firing pin. A channel cut lengthwise in its exterior receives the extractor. This channel is connected with the firing-pin hole by a slot. The notch in the side of the extractor channel opposite this slot permits the escape of gas entering the firing-pin hole from a leaky or pierced primer.

The movement of the locks can be clearly seen in Plate V, which is a development of the cam cylinder, rear barrel plate, cocking switch, and barrels, and shows the locks in their different positions. Lock I is moving along the "loading flat" and a cartridge has been dropped in front of it by the hopper. Locks II and III are moving forward along the "cocking groove," and are pushing the cartridges into the chambers. The head of the firing pin of Lock IV has been caught by the cocking switch and the mainspring is being compressed. Lock V has passed out of the "cocking groove" onto the "firing flat," the cartridge is fully inserted in the chamber, and the compression of the mainspring completed; the firing pin is on the verge of escaping from the cocking switch. Lock VI shows the position of the parts after the cartridge is fired. Locks VII and VIII are moving to the rear in the "extracting groove" and the extractors are withdrawing the empty shells. Lock IX has reached the posi-

tion where the empty cartridge shell is ejected by the hopper plow. Lock X has passed out of the "extracting groove" onto the "loading flat," and is the next to occupy the position of Lock I. In one revolution of the main shaft each lock occupies in succession all the positions shown, and has inserted and fired one cartridge and extracted the empty shell.

The extractor (48, Pl. III), a spring, is held in its seat in the lock by the extractor screw (49, Pl. III). The screw hole in the extractor is elongated to permit the extractor to have a small longitudinal movement. In rear of the hook is an inclined projection which engages a similarly inclined surface in the slot connecting the extractor channel with the firing-pin hole. When the lock is moved forward into the recess in the rear barrel plate, the extractor is pushed to the rear, disengaging this projection, which permits the hook to ride up the inclined slot in the rear end of the barrel so it will not rest on the cartridge when fired. When the lock is moved to the rear after the cartridge has been fired, this projection is engaged, forcing the extractor downward and insuring a firm grasp of the hook on the shell.

The firing-pin bushing (51, Pl. III) is screwed into and closes the rear end of the firing-pin hole in the lock, being secured by the firing-pin bushing screw (52, Pl. III), which can be inserted only when the bushing is screwed its entire length into the lock and the mark on the rear end of the bushing is opposite that on the lock. Its front end forms the rear bearing of the mainspring, and the firing pin passes through its center; it holds these two pieces in the lock.

The firing pin (50, Pl. III) is solid. Its rear end has a knob-shaped head by which it is caught in the groove of the cocking switch. Near its front end is a thread on which the firing-pin nut (53, Pl. III) is screwed and held in place by the firing-pin nut pin (54, Pl. III). In the two rectangular channels in its exterior work the arms of the firing-pin sleeve. The nut holds this sleeve on the firing pin.

The rear end of the firing-pin sleeve (55, Pl. III) forms the front bearing for the mainspring (106, Pl. III), and the arms, which are longer than the nut, strike against the shoulder of the firing-pin hole in the lock, thereby leaving the firing pin and nut, when the mainspring is not compressed, free to move between the shoulder and the sleeve. This allows the firing pin to rebound after firing, withdrawing the point within the lock.

The front sight (64, Pl. III) is fastened to the right rail of the frame, near the front, by the front-sight screw (65, Pl. III), and is adjusted to correct for drift and other deviating causes except wind at 200 yards.

The rear-sight seat (121, Pl. III) is attached to the right side of the breech casing by the rear-sight seat screw (122 Pl. III) and rear-

sight spring screw (124, Pl. III). The rear-sight spring (123, Pl. III) is also fastened by the rear-sight spring screw; its rear end projects down into the sight hole in the seat, and, bearing against the flat surface on the front of the sight body, holds it when adjusted for any elevation and also retains it in its seat.

The rear sight consists of the rear-sight body (120, Pl. III), the rear-sight windage slide (125, Pl. III), the rear-sight windage-slide adjusting screw (126, Pl. III), and the rear-sight windage-slide adjusting-screw nut (127, Pl. III), and nut pin (128, Pl. III).

The rear-sight body is T-shaped, the upright portion being cylindrical and graduated from 200 to 2,800 yards, inclusive, the graduations being numbered and marked by circles on its surface. The sight is adjusted for any elevation by moving it until the graduation mark is even with the notch of the sight seat. The horizontal portion of the rear-sight body contains the seat for the rear-sight windage slide and rear-sight windage-slide adjusting screw. The ears at both ends project into the undercuts in the knurled rear-sight windage-slide adjusting-screw nut and in the head of the rear-sight windage-slide adjusting screw. The nut is secured to the screw by the rear-sight adjusting-screw nut pin. On the rear top edge of the horizontal portion of the rear-sight body are placed the wind-gage graduations. There are 24 of these graduations, each of which is 0.025 inch wide and corresponds to a lateral displacement on the target of approximately 2 inches for each 100 yards of range. The upper part of the rear-sight windage slide contains the rear sighting notch, surrounded by a circular hood. The notch is a semiellipse 0.05 inch wide at the top and 0.05 inch deep. The horizontal distance between this notch and the horizontal point of the front sight is 44.55 inches.

The elevation and direction are given to the gun by the pointing lever (107, Pl. III), the front end of which is hinged to the mount on the pointing-lever axis pin (114, Pl. III). This pin is inserted from the left side and is retained in place by the pointing-lever axis-pin washer (116, Pl. III) and the pointing-lever axis-pin nut (115, Pl. III). The lug keys on the pin enter notches in the lever and washer, causing the pin and washer to move with the lever.

The pointing lever is connected with the gun by the pointing-lever binder (108, Pl. III), the upper side of which fits into its seat between the ears on the underside of the breech casing and is pivoted therein on the pointing-lever binder pin (109, Pl. III). This pin is secured in place by the pointing-lever binder-pin washer (111, Pl. III) and the pointing-lever binder-pin key (110, Pl. III).

The pointing-lever binder screw (113, Pl. III) is seated in the left wall of the pointing-lever binder and is manipulated by its handle. It bears against and, when screwed in, forces the pointing-lever

binder plate (112, Pl. III) **against** the pointing lever so that the latter is firmly clamped between it and the right wall of the pointing-lever binder.

To adjust for elevation, unclamp the pointing-lever binder screw and raise or lower the pointing lever; to give the direction, unclamp the mount and move the pointing lever.

DISMOUNTING AND ASSEMBLING.

In dismounting and assembling it is important to remember that the following keys are tapering: Barrel-plate key, rear-guide nut key, crank-shaft worm key, and crank key.

This gun should never be dismounted except by one thoroughly familiar with it, and then only when necessary for repairs or general cleaning.

It is dismounted in the following order:

1. Feed guide.
2. Locks. To do this, turn one of the lines on the rear barrel plate opposite the arrow on the hopper, turn the handle of the lock plug until the securing stud is opposite its slot in the cascabel plate, then draw the lock plug to the rear; a lock will be withdrawn with it. Replace the lock plug and turn the next line on the barrel plate opposite the arrow and proceed as before until all ten locks have been removed; then unscrew the chain screw eye and remove the lock plug.
3. Hopper-hinge block screws, and then hopper and hopper-hinge block, after releasing hopper latch.
4. Crank key; then crank, by unscrewing to the left.
5. Gun from carriage or mount.
6. Adjusting-knob screw; then knob, washer, and spring.
7. Cascabel-plate screws; then turn the cocking-switch knob so the arrow on the head of the cocking-switch plug points upward; slip the cascabel-plate wrench on the shaft, and insert its lug in the lock-plug hole and turn it about an inch to the left to disengage the cocking-switch plug spindle from the cocking-switch spring spindle. The plate can then be unscrewed, but the cocking-switch knob *must be kept fully drawn to the rear all the time to prevent the spindle striking the lock-plug sleeve.*
8. Crank-shaft worm key; then crank shaft, worm, and collar.
9. Worm gear.
10. Breech-casing screws and breech casing.
The barrels should be supported while removing the breech casing.
11. Frame.
12. Rear-guide nut-key screw and rear-guide nut key; then, with rear-guide nut wrench, the rear-guide nut.
13. Lock cylinder and carrier block.

14. Main shaft and front barrel plate, by driving shaft forward through rear plate.

15. Front barrel-plate key; then front plate from shaft.

16. Cam-cylinder screws, and draw the cam cylinder out of the front end of the breech casing.

17. Recoil-plate screws and recoil plate.

18. Cocking-switch screw and cocking switch.

19. Cocking-switch plug spindle pin; then plug, spring, and spindle.

20. Cocking-switch knob sleeve and knob.

21. Hopper-throat screws and throat walls; the wheel is removed and the walls separated by removing the throat-wheel pivot.

22. Neck screws, neck, pendulum screw, and pendulum of feed guide.

To dismount a lock, remove the bushing screw, insert the prongs of the lock screw driver in the notches in the bushing, and unscrew it; remove the firing pin, bushing, mainspring, sleeve, and nut, assembled; remove the extractor screw, then the extractor. The assembled firing pin is dismounted by driving out the firing-pin nut key and unscrewing the nut.

Under no circumstances should the barrels be removed from the rear plate nor the diaphragm from the breech casing, except at an arsenal.

To assemble, reverse this order.

CLEANING AND CARE OF THE GUN.

As the residuum of smokeless powder, if not completely removed, corrodes the bore in a short time, care is required in cleaning the gun after firing.

To clean the barrels, insert an empty cartridge shell, the front end of which has been plugged, in the chamber of a barrel and turn the handle until its lock is on the firing segment; the barrel will then be on the right of the lowest; clean the bore with rags saturated with soda water, or, if that is not obtainable, with water; remove the shell and proceed in the same manner with the remaining barrels. Remove the locks and open the hopper, clean the chambers from the rear; then wipe both chamber and bore of each barrel thoroughly dry with clean rags, and, finally, oil them with cosmoline oil, leaving a slight coating.

With dry rags clean the carrier block, giving special attention to the grooves, and apply a light coating of oil. The bottom of the hopper and throat should be similarly cleaned and oiled. Before inserting the locks they should be thoroughly cleaned and well

oiled; in case gas has entered a firing-pin hole the lock should be dismantled and all the parts and the hole and channels in the lock well cleaned.

All unburned grains of powder and dirt must be removed from the recesses in the rear barrel plate and barrels.

In general, the remaining parts can be cleaned with dry rags without further dismantling; after cleaning, all surfaces should be lightly coated with oil.

It is imperative that all bearing surfaces be kept properly oiled, and especially the following: The front bearing of the main shaft, oil to be applied through hole in frame; the adjusting-knob washer, oil to be applied through hole in cascabel plate above the washer; the worm and worm gear, oil through first hole in top of breech casing in front of cascabel plate; the rear bearing of main shaft in diaphragm, oil through second hole in top of breech casing; the segments and grooves of cam cylinder, oil through third hole in breech casing; the crank shaft, oil through hole in each bearing in breech casing; the crank-handle rivet, oil through hole in handle; the throat wheel, oil to be lightly applied from bottom of hopper at each end; pendulum pivot, oil to be applied through screw hole. The ribs and lugs of the locks should at all times be kept lightly coated with oil.

REMARKS.

These models of the Gatling gun are equipped with the gravity feed (Bruce). The cartridges are fed directly from the paper box by stripping off the cover, placing their heads against the front of the feed-guide body and the rib on its left side, then pushing them down into the pendulum grooves and pulling off the box.

Should the regular movement of the cartridges through the feed guide or hopper stop, pressure of the hand on the top cartridges in the feed guide or the raising of them by inserting the finger in the opening in the left side of the hopper will, in general, remove the interruption.

Should the turning of the crank be stopped or become difficult, by the jamming of a cartridge between the carrier block and hopper, by the striking of a cartridge against an empty shell left in the chamber, by the failure of the extractor to remove it, or from some other cause, turning of the crank should be stopped, the hopper opened, and the cause of the jam removed. Before closing the hopper all cartridges not in the chamber should be removed.

The firing pins should not be unnecessarily snapped. To prevent this the cocking-switch knob should be turned to the safety position. It should not, however, be needlessly left in that position or the cocking-switch spring will be weakened.

If, in firing, an extractor, firing pin, or lock be disabled, the lock should be removed and the firing continued with the other barrels.

The locks and barrels are numbered from 1 to 10. The locks are interchangeable, but to insure the most satisfactory action should be assembled so that each barrel and its corresponding lock have the same number.

The adjustment of the head space is most important; if it is too small, the distance between the barrels and recoil plate will be less than the length of the locks; if too great, this distance will be longer than the locks, and the cartridge shells will be liable to rupture and leave a portion of the shell in the chamber. When the guns are new the proper head space is that given by the notch in the adjusting knob numbered "1." To adjust for a gun that has been worn or for variations from other causes, the proper notch should be found by trial by running through the gun ball cartridges, with the cocking switch at "safe." The proper notch will generally be found to be that one farthest to the left at which the locks will not bind.

If the head space is too great the cartridges will be stretched and often pulled apart. An examination of the empty shells will show whether or not they have been stretched.

In order to obtain the greatest efficiency of fire with this gun, its rate of firing should not exceed 600 rounds per minute. Ordinarily the crank should be turned at the rate of one and a half revolutions per second, which will give about 525 rounds per minute. In an emergency this rate can be greatly increased.

METALLIC CARRIAGE FOR THE GATLING MACHINE GUN, CALIBER .30, MODELS OF 1895, 1900, AND 1903, AND GATLING GUN, CALIBER .45, MODEL OF 1890.

(Pl. I, side view; Pl. VI, front view.)

This carriage is entirely of metal, except the spokes and felloes of the wheels. The principal parts are the axle or body, wheels, trail, gun mount, shield, and apron.

The axle is composed of the axle or carriage body and axle arms.

The body is a box beam built of steel plates 0.15 inch thick. The top, lower, and front are single plates, while the rear face is formed by the trail, two end plates, two corner plates, and two doors. The plates are securely riveted to $1\frac{1}{2}$ by $1\frac{1}{2}$ inch steel angles, which form the corners or edges of the body and add greatly to its stiffness and strength. Both of the front and the upper rear body rails or angles extend the whole length of the axle body. The lower rear body rail is made in two parts, the inner ends being turned to the rear and riveted to the side plates of the trail.

A $2\frac{1}{2}$ -inch steel T rail riveted to the underside of the lower body plate in the plane of the axle arms stiffens the body and provides a means of attaching the apron.

The front of the body is circular in horizontal section, having a radius of 47.5 inches, while the rear is formed by the intersection of two vertical planes with the trail. The whole forms a box about $3\frac{1}{4}$ inches high, 17 inches wide from front to rear in the middle section, $3\frac{1}{4}$ inches at the ends, and about 40 inches long inside dimensions. This compartment is used for carrying ammunition, which is reached through two small doors in rear, one on each side of the trail. These are hinged to the lower rear body rail at the bottom and fastened by turn-buckles at the top.

The axle arms of forged steel, one right and one left, terminate in bodies $5\frac{1}{4}$ inches long and rectangular in cross section, which extend inside the ends of the body, to which they are fastened by six $\frac{7}{8}$ -inch bolts passing through them, both top and bottom body plates, and the T rail underneath. This fastening is stiffened by four quoins inside the body between the rectangular ends of the arms and the front and rear faces of the axle body.

WHEELS.

These are the Archibald pattern, 54.75 inches in diameter, lighter than those for the field gun, and the same for carriage and limber.

The linchpin is round, one-half inch in diameter, and has a hook catch designed to pass around and under the arm after the pin is in its seat. Between the pin and the end of the nave is the linchpin washer, backed by one of leather. Two models of linchpin washers are supplied; one with eye loop for use with dragropes and one without this loop. They may be used on all carriages.

TRAIL.

The trail, similar to the axle body in construction, is built of an upper, a lower, and two side trail plates of steel, 0.15 inch thick, riveted to $1\frac{1}{2}$ by $1\frac{1}{2}$ inch steel trail rails, which are on the inside corners of the trail. The front end of the upper trail plate is securely riveted to the top axle body plate, which is extended to the rear and bent down at the proper angle for this purpose. The lower trail plate extends forward under the lower axle body plate, to which it is riveted. The side trail plates are fastened to the axle body by riveting to the lower rear body rail.

The lunette, which is a single forging, abuts against the rear end of the lower trail plate and is riveted to the lower angle irons or trail rails and to the handspike plate which covers the rear of the trail. This plate is riveted to the upper trail rails in front, to the lunette in rear, and is provided with a fulcrum and bolt for attaching the trail handspike.

The handspike is made from 1-inch wrought-iron pipe, and is fastened to the fulcrum of the handspike plate in such a manner that when the handspike is not in use it may be laid along the top of the trail.

The trail is divided into two compartments by a transom about 15 inches from the front end. The lower of these compartments may be used to carry tools, cleaning material, and spare parts, and the upper for ammunition.

The lower door or seat forms a seat for the gunner when raised and supported by the seat prop with which it is fitted. A trail handle is riveted to each side of the trail.

GUN MOUNT.

The gun-mount body or pivot yoke is a Y-shaped bronze casting, about 17 inches long over all. This is provided with trunnion beds for mounting the gun, and terminates at the lower end in a pivot 3 inches in diameter and 4.2 inches long, which fits into a seat or saddle in the axle body. The mount is held in the saddle and tightened to

prevent turning by a clamp screw passing axially through the pivot and engaging in a washer nut which is prevented from rotating with the clamp screw by the washer-nut screw entering the bottom of the pivot through the washer. Motion in azimuth is limited by a lug on the mount striking against two stop pins in the saddle. The cap squares are hinged at the rear to permit ready removal of the gun, and are secured in front by locking keys to hold the trunnions of the gun in position.

Motion in azimuth and elevation is given by the elevating and traversing lever, which is forked and attached to the gun mount just above the pivot by a pin connection and to the gun by a hinged elevating clamp on the under rear side of the casing. The elevating and traversing lever is issued as a part of the gun.

SHELLS.

The shield is a hardened-steel plate 0.2 inch thick, circular in horizontal section so that it fits the front face of the axle body. It is 46 inches high and 57 inches wide, measured on the chord, filling the space above the axle and between the wheels.

It is fastened to the body by four toe straps riveted to its front face, the lower ends of which are conical in shape, without nuts, and fit into holes in the front flange of the lower front body rail. The shield is prevented from rising by four horizontal bolts passing through it, the toe straps, and the upper flange of the upper front body rail. Two braces riveted to the rear face and bolted to the upper rear body rail hold the shield firmly in its upright position.

The port for the gun is 10.5 inches wide by 11.4 high, in order to give sufficient room for motion of the gun on the carriage. This port is covered by a saucer-shaped port shield 24 inches in diameter secured by brackets to the frame of the gun. The opening in this shield is 6.1 inches in diameter, or just large enough to admit the gun with a sufficient clearance for turning. The opening is cut away enough at the proper point to permit aiming. This shield while attached to the gun when in position is issued as a part of the carriage.

The apron is a flat, hardened-steel plate of the same thickness as the shield, 57 inches wide and 22.35 inches deep, occupying the space under the axle between the wheels. It is fastened to the T rail under the axle body by three strap hinges, and when not in use is turned back and fastened to the under side of the trail by a stud and key.

LIMBER.

(Pl. VII.)

The limber is entirely of metal, excepting the ammunition chest, pole, neck yoke, and the spokes and felloes of the wheels.

The axle is of forged steel, rectangular in cross section. Three seats are cut in the axle body for the center and side rails of the limber frame. The axle arms are of the same dimensions as those for the carriage and are set so that the bottom element is parallel to the axis of the axle.

The wheels, linchpins, and washers are the same as those for the carriages.

The side rails are of angle irons 3 by 2 inches, with the exterior of the 3-inch face toward the wheels. That portion of this face which passes over the axle body is cut out to fit it. A blocking piece is used on top of the axle between it and the upper flange of the side rail to avoid cutting away the whole vertical flange. The rails are securely held in their seats by understraps which pass under the axle and are riveted to the rails.

The middle rail consists of two 3 by 2 inch angle irons with the edges of the top flanges in juxtaposition. The vertical flanges are cut out and blocking is placed under the top flanges for the same reason as in the side rails, and the rail is similarly secured to the axle by an understrap. The middle rail is $6\frac{1}{4}$ inches longer than the side rails, extending this distance to the front to form a seat for the doubletree bolt strap and a socket for the pole.

A cross rail of 3 by 2 inch angle iron extends across the front of the side rails, to which it is fastened by riveting through the cross-rail brackets. The vertical flange of this rail is cut out where it passes over the center rail, to which the upper flange is riveted.

The doubletree bolt strap around the front end of the middle rail forms a clasp for the pole and a support for the steel doubletree mounted on the doubletree bolt, which is forged solid with the doubletree strap.

The rear end of the pole abuts against the pole stop, which is riveted to the side faces of the middle rail. The pole is secured in its seat by the pole bolt which passes through it and the sides of the middle rail. The bolt is locked by turning it so the shoulders of the slots in the two ribs projecting from its sides prevent motion endwise.

The doubletree bolt brace passes over the bolt and is held in position by a nut. It is made in the form of a fork, the rear ends being securely bolted to the cross rail on either side of the middle rail.

The pintle, 9.97 inches long, is mounted between the sides of the middle rail, to which it is fastened by two pintle bolts on each side. The pintle hook at the rear end of the body has an eye through its knob through which the pintle key is passed to secure the lunette of the gun carriage. This key is fastened by a chain to the side of the middle rail.

There are three metal footboards, 0.12 inch thick, riveted to the rails in front of the ammunition chest. (Some limbers in service

have but two metal footboards, but when such limbers are received at Rock Island Arsenal they will be modified by moving the chest farther to the rear and increasing the number of metal footboards from two to three.) A footboard rack about 10 inches high incloses the footboards. This is formed of two $\frac{1}{2}$ -inch round steel rails, which are fastened to the front face of the ammunition chest and extend horizontally around the footboards, being supported in front by passing through steel standards fastened to the middle and side rails. This forms a convenient place for carrying the haversacks and equipment of the gun detail.

The pole is wood and has a leather pole pad on the front end and a neck-yoke stop on its underside. It is provided with a folding-pole prop, which is carried in fixtures provided for the same under rear of limber, attached to side rails.

The ammunition chest is mounted on the limber frame in rear of the footboards, and is secured by four bolts, one in each corner of the chest, which pass through plates on the inside of the chest and through the upper flanges of the side rails. It is made of poplar strengthened by 6 angle plates, 4 for the corners and sides and 2 for the bottom; the middle portion of the rear side is protected by a corrugated-steel safe plate. These plates are fastened by copper rivets and screws. The lid is hinged with strap hinges, the body strap being long enough to extend down the entire front side of the chest and turn 4 inches under the bottom, while the other extends about 19 inches on the cover, thus adding greatly to the strength of the chest.

The hasp strap is secured to the top by rivets. The turnbuckle by which the hasp is secured is mounted on the turnbuckle pivot, whose plate is riveted to the rear face of the chest by 2 rivets.

The interior of the chest is divided into three compartments by two vertical partitions, held in place by being rabbeted into the front and back and further secured by screws. The lid of the chest is supported when open by a brass lid prop and is covered with heavy cotton duck painted to render it waterproof.

The parts of the carriage are as follows:

CARRIAGE.

Axle body:

Top body plate.

Lower body plate.

Front body plate.

Rear plates—

End plates, right and left.

Trail corner plates, right and left.

Upper front body rail.

Lower front body rail.

Upper rear body rail.

Axle body—Continued.

Lower rear body rails, right and left.

*Body doors, hinges, and pins.

*Body-door turnbuckles and studs.

Quoins—

Front, 2 right, 2 left.

Rear, 2 right, 2 left.

Rail "T."

Saddle (for gun mount).

Saddle stop pins.

Rivets.

*Axles, right and left:

*Axle bolts and nuts.

*Linchpins, right and left.

*Linchpin washers. (NOTE.—Two models of linchpin washers are supplied—one with eye loop for use with drag ropes and one without the loop.)

Trail:

*Apron eye stud.

*Apron key chain and stud.

*Door key chain and stud.

*Eye stud bracket.

*Handspike.

*Handspike bolt.

*Handspike plate.

Lower trail plate.

Lower trail rails, right and left.

*Lower door or seat.

*Lower trail door hinge plate.

*Lunette.

*Prop rest.

*Seat prop.

Side trail plates, right and left.

Transom.

*Trail door hinges. (NOTE.—These hinges are common for upper and lower trail doors.)

*Trail door eye studs.

*Trail handles.

*Upper trail door.

Upper trail plate.

Upper trail rails, right and left.

*Bolts and rivets.

Shield:

*Apron.

*Apron hinges.

*Main shield.

*Port shield.

*Port shield brackets, right and left.

*Port shield bracket screws.

*Shield braces, right and left.

*Shield-brace bolts.

*Toe straps.

*Toe-strap bolts.

*Toe-strap rivets.

*Wheels :

Felloes, bolts, and nuts.

*Nave box.

*Nave-box flanges.

*Nave-box bolts and nuts.

Tire.

*Gun mount :

*Body.

*Cap squares.

*Cap-square locking keys.

*Cap-square locking-key securing screws.

*Clamp screw.

*Clamp-screw handle.

*Clamp-screw handle pin.

*Clamp-screw stop pin.

*Clamp-screw stop washer.

*Clamp-screw stop washer pin.

*Clamp-screw washer nut.

*Clamp-screw washer nut screw.

*Hinge pins.

LIMBER.

Frame and connected parts (metal).

Axle.

Cross rail.

*Doubletree (metal, same as 3.2-inch gun).

*Doubletree bolt and strap.

*Doubletree bolt brace.

*Doubletree stay chain.

*Doubletree end hooks, right and left.

Footboards (metal), front.

Footboards (metal), middle.

Footboards (metal), rear.

Footboard rack rods.

Footboard rack standards, middle.

Footboard rack standards, side, right and left.

*Linchpin, right and left.

*Linchpin washers. (NOTE.—Two models of linchpin washers are supplied.

One with eye loop for use with drag ropes and one without the loop.)

Middle cross-rail bracket.

Middle rail.

Middle rail under strap blocking.

*Neck yoke. (NOTE.—Same as 3.2-inch gun.)

*Pintle.

*Pintle bolts and nuts.

*Pintle key and chain.

*Pole. (NOTE.—Same as 3.2 inch gun.)

*Pole pad.

*Pole bolt.

*Pole prop. (NOTE.—Same as 3.2-inch gun.)

*Pole prop swing.

*Pole prop hinge piece with bolts.

Pole prop stop.

Side rails, right and left.

Side rails under strap blocking.

Frame and connected parts (metal) —Continued.

Side cross rail bracket.

*Singletree (metal, same as 3.2-inch gun).

*Singletree hooks.

*Singletree eyes.

Under-straps, middle rail.

Under-straps, side rail.

*Rivets and bolts.

Wheels:

Same as on carriage.

Ammunition chest (wood, ironed):

*Chest.

*Corner plate.

*Canvas cover (on lid).

*Copper strips, covering hinge and hasp straps.

*End plates.

*Hasp.

*Hinges.

*Lid.

*Lid prop.

*Hasp strap.

*Paulin straps (on lid).

*Safe plate, corrugated.

*Turn-buckle, pivot, washer, and plate.

Two wooden partitions.

*Bolts, nuts, and plates to fasten chest to body.

The parts of carriage and limber marked thus (*) are issued for repairs when needed.

If the carriage or limbers should be damaged to such an extent as to not readily admit of repairs by issue of the parts above specified, authority should be obtained to turn the vehicles into Rock Island Arsenal for repairs.

TOOLS AND ACCESSORIES.

The following tools and accessories are furnished for each carriage and limber:

2 Bruce feed guides.

1 cascable plate wrench.

1 drift.

1 lock screw-driver.

1 lever axis pin nut wrench.

1 oil can.

1 paulin, 12 by 12 feet.

1 pin wrench.

1 rear guide nut wrench.

1 shell driver.

1 small screw-driver.

1 T screw-driver.

1 wiping rod, brass.

For carriages equipped with linchpin washers with loop for drag rope, two drag ropes will be furnished for each carriage upon request.

The following ammunition will be carried on the carriage and limber:

9,900 rounds of ammunition in limber chest.

1,000 rounds in compartments in body of carriage.

300 rounds in upper trail compartment.

The battery wagon and forge will be issued to Gatling gun batteries with its full equipment of tools and materials for cleaning and preservation constituting a full six months' supply.

When a company is equipped as a "Gatling-gun battery" the equipment of the battery will consist of the following:

6 Gatling guns, caliber .30.

6 carriages for Gatling guns, caliber .30.

6 limbers for machine guns.

1 battery wagon and forge.

1 store wagon.

1 spare wheel.

1 spare pole.

9 sets of lead harness.

8 sets of wheel harness.

17 harness sacks.

The carriages are each drawn by 4 horses, the battery wagon by 6 horses, and the store wagon by 4 horses.

WAR DEPARTMENT,

OFFICE OF THE CHIEF OF ORDNANCE,

Washington, April 11, 1910.

June 1, 1905.

Revised October 15, 1906.

Revised April 11, 1910.

Form No. 1769.

Ed. Aug. 27-17-500.

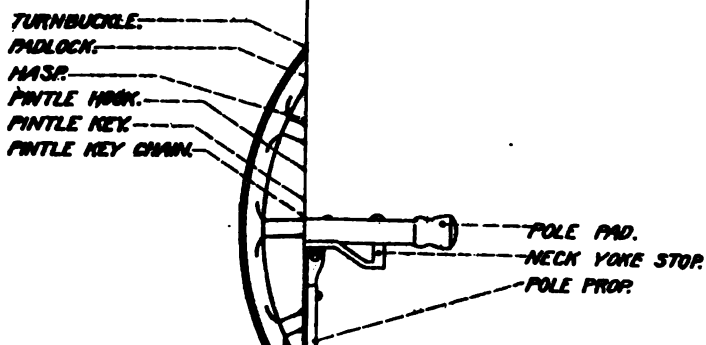
5868-254-2.



MAN SHIELD
CAP SHIELD
FOOT SHIELD

THE STRAP
POINT
APPROX

THE STRIP
 T. FOL.
 LONG FOL.
 AILE.
 TRAIL.



S.

Stanford University Libraries



3 6105 122 874 725

